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(19) (CA) **CANADIAN PATENT** (12)

(54) Method and Apparatus for Forming a Face Mask with Ear Loops

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Abstract:

A face mask includes a layer of meltblown polypropylene fabric having pleats formed therein. An ear loop and an ear loop formed from lycra spandex are attached to the corners of the layer. Application of heat along seams and attach the ear loops and thereto in addition to securing the ends of the pleats. In this manner, internal fibers of the layer are restrained from entering the surrounding environment.

BACKGROUND OF THE INVENTION

Face masks that are designed to be worn in sanitary environments such as hospitals or the like require the use of a fibrous material for filtering any contaminants from the wearer. Present face masks generally utilize a sewing operation in the fabrication thereof which requires a needle to pierce the fibrous material in order to form the seams thereof. This procedure results in perforations in the material such that the fibers contained therein can escape and potentially contaminate the environment. Also, the perforations provide passages for contaminates to pass through. With such masks, the fibers released by the sewing operation may be breathed by the mask wearer, as the wear is continually inhaling and exhaling through the mask. This is an undesirable condition in that it is of primary importance that all sources of contamination be minimized to any extent possible. Therefore, there exists a need for a sanitary face mask that does not have the disadvantages of the sewn face masks described above.

Previously developed face masks have also generally been secured to the head of a wearer by elongated ties which must be tied together by the wearer. Such ties are often difficult to attach together and sometimes tend to become unfastened. A need has thus arisen for a sanitary mask with looped earpieces which provide a comfortable fit while being easy to attach over the ears of the wearer.

SUMMARY OF THE INVENTION

The present invention disclosed herein comprises a method and apparatus for forming a sanitary face mask that maintains the integrity of the mask material by preventing the fibers thereof from escaping the confines of the material. The apparatus includes a layer of fabric dimensioned to cover the nostrils and mouth of the wearer, the fabric fabricated from a heat malleable material. First and second ear loops are fabricated from an elongated layer of heat malleable material. Each end of the first and second ear loops are attached to the layer of fabric on one side thereof with a heat formed seal. The heat formed seal prevents the fibers from escaping from the fibrous layer.

In an alternate embodiment of the present invention, a reinforcing member is disposed adjacent the upper edge of the face mask and a portion of the edge is folded over the rigid member and heat sealed around the perimeter of the semi-rigid member. The semi-rigid member provides support for the upper portion of the face mask about the face of the wearer. Pleats are formed in the fabric layer to allow expansion thereof. The edges of the pleats are heat sealed such that only the center portion of the fabric in the pleats can expand to conform to the face of the wearer.

In yet another embodiment of the present invention, a method is provided that includes the step of fabricating a layer of fibrous heat malleable material that is dimensioned to fit over the mouth and nostrils of the wearer. First and second ear loops are then fabricated from a layer of elastically deformable heat malleable material. Each of the first and second ear loops is attached to opposite sides of the fibrous layer

by applying heat to the juncture of the ear loop material and the fibrous layer material such that an attachment is formed therebetween without the fibers escaping from the fibrous layer.

In yet another embodiment of the present invention, pleats are formed in the layer of fibrous material and the sides thereof heat sealed to allow only the center portion of the fibrous layer to expand. The edges of the fibrous layer are folded over and heat sealed to form seams therearound.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying Drawings in which:

FIGURE 1 illustrates a perspective view of the face mask disposed on a wearer;

FIGURE 2 illustrates a planar view of a face mask of the present invention; and

FIGURE 3 illustrates an expanded view of the attachment point of the ear loop to the corner of the face mask.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGURE 1, there is illustrated a perspective view of a face mask 10 disposed on a wearer. The face mask 10 is comprised of a rectangular shaped layer 12 of pleated material, an ear loop 14 attached to one side and an ear loop 16 attached to the other side. The ear loops are designed to fit over the ears of the wearer and the pleated material allows for expansion in the middle of the layer 12 only. In this manner, the lower end of the layer 12 can expand down over the chin of the wearer and the upper end can extend up over the bridge of the nose of the wearer. In this manner, the face mask 10 provides some conformation to the face of the wearer to prevent contaminants from entering the environment due to the inhaling and exhaling of the wearer.

Referring now to FIGURE 2, there is illustrated a planar view of the face mask 10. The layer 12 is formed of a synthetic, thermoplasic polymeric micro-fiber material. Such a material is disclosed in U.S. Patent No. 3,837,995 issued to J. Floden. The synthetic micro-fiber allows for hot melting techniques to provide adequate bonding thereof. These fabrics are referred to as Meltblown Polypropylene fabrics that can be obtained from Kimberly-Clark Corp. of the type-1/oz/sq. yd. Code No. 1270-00-00-00.

The layer 12 is formed from a larger layer that is folded a plurality of times to form pleats 18, 20 and 22 that are oriented horizontal with respect to the face of the wearer. A seam 24 and a seam 26 are formed along the lateral sides thereof to prevent the pleats 18-22 from separating at the edges. The seams 24 and 26 are formed by heat bonding techniques, that is, applying heat and pressure to form a seal therebetween. In so doing, only

the center portion of the pleats 18-22 in the layer 12 are allowed to expand to conform to the face of the wearer.

Given our invention, persons skilled in the art would realize that a high-frequency method of heat bonding takes much less time than a convention heat bonding process, and therefore such persons would appreciate the advantages in terms of expense and increased production rates attendant on a high-frequency heat bonding process.

A semi-rigid member 28 is disposed adjacent the upper horizontal edge of the layer 12. A portion of the layer 12 on the edge thereof is folded over the semi-rigid member 28 and attached to the surface thereof with a heat bonded seam 30. The seams 24 and 26 are formed after the seam 30 such that they form a lateral seam, thus enclosing the semi-rigid member 28 within the sterile confines of the layer 12. A seam is formed on the diametrically opposite edge of the layer 12 by folding a portion thereof over and heat bonding a seam 32 therein. The seam 32 is primarily utilized to define the edge of the layer 12.

The ear loop 14 is attached by heat bonding to one corner of the layer 12 at a point 34 and to an opposite corner on the same edge thereof to a point 36. The ear loop 16 is attached on a diametrically opposite side of the layer 12 from the ear loop 14 with one end thereof attached to a point 38 on one corner thereof and to a point 40 on the opposite corner.

Referring now to FIGURE 3, there is illustrated an expanded view of the attachment point 34 of the ear loop 14. The ear loop 14 is fabricated from a combination of texturized polyester and lycra spandex. In the preferred embodiment, the material is formed from 90.33 percent of 78 Denier texturized polyester and 9.67 percent of 40 Denier lycra spandex. This material is cut into a thin strip and, due to the properties of the material, this strip will "roll over", that is, the edges thereof will curl up. In this manner, an elastically deformable strip is formed that has a semi-circular cross section to provide some comfort behind the ears of the wearer.

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Due to the properties of the ear loops 14, heat bonding techniques such as rf heat bonding can be utilized. Given our invention, persons skilled in the art would realize that the use of a synthetic fabric, such as the lycra spandex/polyester fabric of the invention allows the use of a high-frequency heat bonding technique to attach the fabric to another synthetic fabric, and further would understand that heat bonding cannot be used with conventional rubber or thread-coated rubber loops because their structural integrity would be destroyed. Further, persons skilled in the art would realize, given our invention, that ear loops made out of lycra spandex/polyester fabric have more "give" than conventional rubber or thread-coated rubber ear loops, and as such are much more comfortable to the sensitive skin behind the ear of the wearer. Therefore, to attach the loop 14 at the points 34 and 36, it is only necessary to apply suitable amounts of heat and pressure thereto. With such techniques, performation of the mask material with a needle is not required. In the preferred embodiment, the seams 24 and 26 are formed by placing the free ends of the ear loops 14 and 16 thereon and forming the pleats 18-22 at the same time that the loops 14 and 16 are bonded thereto.

In summary, there has been provided a sterile face mask that reduces the amount of internal fibers thereof that escape into the surrounding environment or which are breathed by the wearer. The face mask includes a layer 12 formed of meltblown polypropylene fabric with ear loops 14 and 16 heat bonded thereto. The use of heat bonding techniques allows the attachment of the ear loops thereto without puncturing the surface of the material. This prevents internal fibers of material from escaping to the surrounding environment.

Although the preferred embodiment has been described in detail, it should be understood that various changes, substitutions, and alterations can be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

Claims:

1. A face mask, comprising:

a layer of fabric dimensioned to cover the nostrils and mouth of a wearer, said fabric fabricated from a fibrous heat malleable material;

first and second ear loops fabricated from elongated strips of elastic fibrous heat malleable material, each of said first and second ear loops having the free ends thereof attached to said fabric layer with a heat formed seal such that the fibers of said fabric layer are not disturbed; and

opposed elongate edges of said strips curling over such that said strips form rounded elongated members for disposal around the ear of the wearer to provide comfort therefor.

2. The face mask of claim 1 wherein said layer of fabric is pleated, the pleats oriented horizontal to the wearer's face and having the ends thereof overlapped and heat sealed on the lateral edges of said fabric layer.

3. The face mask of claim 1 further comprising a reinforcing member disposed integral to said fabric layer along the top edge thereof to provide support on the face of the wearer.

4. A face mask, comprising:

a generally rectangular layer of thermoplastic polymeric micro-fiber material adapted for disposal over the nostrils and mouth of a wearer;

first and second ear loops each fabricated from a thin strip of elastically deformable heat malleable material that has two free ends, the material of said ear loops allowing for high-frequency heat bonding thereof;

each of said loops having the free ends thereof attached proximate a corner of said fabric layer on one of the vertical sides thereof by a high-frequency heat formed seal such that the integrity of said micro-fiber layer is maintained by not invasively attaching the free ends of said loops thereof.

5. The face mask of claim 4 wherein said micro-fiber layer has horizontal pleats formed therein to allow expansion of said micro-fiber layer, said pleats attached together on vertical borders thereof by high-frequency heat sealing such that said pleats on the extremities thereof do not expand or separate.

6. The face mask of claim 4 wherein top and bottom horizontal borders of said micro-fiber layer are sealed by high-frequency heat-sealed seams.

7. The mask of claim 6 wherein a reinforcing member is disposed within said micro-fiber layer between said seam and said top border and a third horizontal high-frequency heat-sealed seam, said reinforcing member disposed proximate the nostrils of the wearer to provide support for said face mask.

8. The face mask of claim 7 wherein said reinforcing member is fabricated from a malleable metal that is bendable to conform to the shape of the wearer's face.

9. The face mask of claim 6 wherein said micro-fiber layer is fabricated from meltblown polypropylene fabric, vertical borders of said micro-fiber layer being ~~selaed~~ sealed by high-frequency heat sealed seams, such that any loose fibers in said micro-fiber layer are confined within said seams.

10. The face mask of claim 4 wherein said ear loops are fabricated from a combination of texturized polyester and lycra spandex material.

11. The face mask of claim 10 wherein said ear loops are fabricated from 90.33 percent of 78 Denier texturized polyester and 9.67 percent of 40 Denier lycra spandex.

12. A method for fabricating a sterile face mask, comprising:

fabricating a layer of material from a fibrous heat malleable material, the layer dimensioned to fit over the mouth and the nostrils of the wearer;

fabricating first and second ear loops from elongated strips of elastically deformable heat malleable material, edges of the strips curling over to form rounded members for disposal over the ear of the wearer to provide comfort therefor; and

attaching each of the first and second ear loops to opposite sides of the fibrous layer by applying heat to the juncture of the loop material and the fibrous layer material such that an attachment is formed therebetween without disturbing the integrity of the fibers in the fibrous layer.

13. The method of claim 12 wherein free ends of each of said first and second loops is formed from an elongated piece of the elastically deformable heat malleable material and the free ends thereof are joined to opposite corners on one of the lateral sides of the fibrous layers.

14. The method of claim 12 further comprising forming pleats in the fibrous layer and heat sealing the lateral edges of the fibrous layer to allow the pleats to expand in only the center portion of the fibrous layer, the pleats oriented horizontal to the face of the wearer.

15. The method of claim 12 further comprising disposing a semi-rigid member proximate the edge of the fibrous layer that is to be disposed over the nostrils of the wearer and folding a portion of the fibrous layer over the semi-rigid member and heat sealing the portion around the perimeter of the semi-rigid member to enclose the semi-rigid member therein.

16. The method of claim 12 further comprising forming a seam on the horizontal edges of the fibrous layer with respect to the face of the wearer by folding a portion of the fibrous layer over itself and heat sealing the respective portions.

17. The method of claim 12 wherein the layer of fibrous material is meltblown polypropylene fabric.

18. The method of claim 12 wherein the ear loops are fabricated of a combination of texturized polyester and lycra spandex.

19. A method for fabricating a sanitary face mask, comprising:

fabricating a layer of meltblown polypropylene fabric having a horizontal and vertical axis;

forming at least one pleat in the meltblown layer along the horizontal axis thereof such that the pleated meltblown layer is dimensioned to fit over the mouth and nostrils of a wearer;

heat sealing the sides of the pleated meltblown layer along the vertical axis thereof to allow the pleats to expand in the center portion only;

disposing a semi-rigid member along one edge of the pleated meltblown layer parallel to the horizontal axis thereof and folding a portion of the edge over the semi-rigid member, the folded over portion heat sealed about the perimeter of the semi-rigid member to completely enclose the semi-rigid member;

forming first and second ear loops from a layer of combined textured polyester and lycra spandex such that each of the ear loops is a narrow strip of the material, the ends of which curl over to form a rounded cross section therefor; and

attaching the free ends of each of the ear loops on opposite ends of one of the lateral sides of the pleated meltblown material on a vertical edge thereof.